

[Understanding Vision](#) 16 Oct 2017

How a patent (EP0039497) filed by ZEISS set new standards for progressive lenses 30 years ago

Help for presbyopia, a special kind of visual problem for optical engineering – then and now

> **Presbyopia, the progressively diminished ability to focus on near objects, has always been a particular challenge for lens manufacturers. Because when the surfaces of the lenses are ground, many different types of optical lenses come together. The search for the "holy grail"—the perfect progressive lens design with no out-of-focus areas—is still ongoing, but in early 1980s, a young employee in Carl Zeiss's mathematics department for spectacle optics scored a coup in the development of progressive lenses.**

The idea of manufacturing spectacle lenses that would offer people with presbyopia continuous vision from distance to near vision has been developed since the beginning of the 20th century. The first attempts to create progressive lenses were made in 1909. They were unsuccessful, however and the lenses were never marketed, since they had too many imperfections. It was not until 1956 that Bernhard Maitenaz from the Société des Lunetiers achieved a breakthrough and his progressive lens was patented. The foundation stone for the progressive lenses of today was laid. Carl Zeiss has been selling this type of progressive lens by the name of "Gradal" since 1970.

What do progressive lenses have to do with horizontal symmetry?

At the end of the 1970s, a young mathematician who had just graduated from university joined Carl Zeiss. On his own initiative, he did not only develop new progressive lens designs in line with new standards by performing time-consuming mathematical lens and area calculations using the basic technique, but he also designed the computer programs required for this. It is worth mentioning that this happened in the days of punch cards and mainframe computers with very limited computer capacities.

Our young employee had only one goal – offering future wearers of spectacles a progressive lens that would help them see better and more naturally, a lens that they could wear comfortably and tolerably. None of these things could be taken for granted back then.

Gerhard Fürter, the mathematician, achieved a milestone in the development of progressive lenses together with the head of the mathematics department, Hans Lahres. This was confirmed in 1981, when Carl Zeiss was granted patent EP0039497 and a vital step towards individual progressive lenses had been taken.

But what was so new and revolutionary about the "Gradal HS" progressive lenses?

In 1983, Carl Zeiss placed the innovative "Gradal HS" progressive lens on the market. The key to this new spectacle lens was its "horizontal symmetry" (HS) developed by Gerhard Fürter. This guaranteed equivalent visual impressions for the right and left eye, as well as comfortable binocular vision, i.e. stereoscopic vision. The comfort level and tolerability improved significantly. Horizontal symmetry ensured that the wearer gets an equally sharp picture of an object with both eyes.

Another sticking point for progressive lenses until then had been the near vision range. Unlike during distance viewing, when we read, our gaze not only moves downwards, but also closer to the nose. Prior to Gradal HS, the progressive lens was rotated towards the nose by about 10° on both sides for this reason. Unfortunately, this meant that the horizontal symmetry could no longer be maintained. Fürter managed to eliminate the need to rotate the lenses for the near range. As a result, the advantages of the horizontal symmetry were retained for stereoscopic vision. Aberrations were able to be avoided and the spectacle lens was able to be better adapted overall. The new progressive lenses were more tolerable for wearers, thanks to an enlarged field of view, particularly at close range, for example when reading. It became also possible to manufacture thinner and flatter lenses with less protrusion and outstanding imaging properties, so that spectacles wearers could see clearly and look good at the same time.



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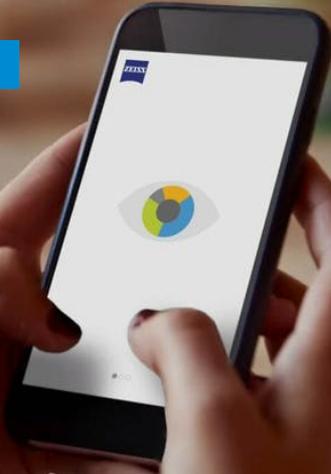
Over the years, the young mathematician became an important leader at Carl Zeiss, where he remains till today. Huge developments have taken place in the field of progressive lenses since Gradal HS was developed, and are still taking place today. Eye acrobatics and long adjustment periods are left in the past. Progressive lenses have been established on the market and are extremely popular. Progressive lenses can be customised to a high degree – like a tailored suit for your sight. An example of the latest generation of individual progressive lenses is

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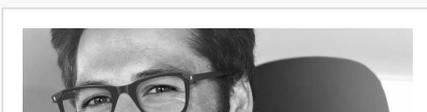


No face is symmetrical, and no two people's eyes are the same distance apart

Only after the spectacle frames have been precisely adjusted to the individual wearer can spectacle lenses perform to their full potential.

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